



## King's Research Portal

DOI:

[10.1177/0004867418816821](https://doi.org/10.1177/0004867418816821)

*Document Version*

Peer reviewed version

[Link to publication record in King's Research Portal](#)

*Citation for published version (APA):*

Young, A., & Hidalgo-Mazzei, D. (2018). Psychiatry foretold. *Australian and New Zealand Journal of Psychiatry*.  
<https://doi.org/10.1177/0004867418816821>

### **Citing this paper**

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

### **General rights**

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

### **Take down policy**

If you believe that this document breaches copyright please contact [librarypure@kcl.ac.uk](mailto:librarypure@kcl.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.

# Psychiatry foretold

Diego Hidalgo-Mazzei, MD, PhD <sup>1 2</sup>

Allan H. Young, MB ChB, MPhil, PhD, FRCP (Edin), FRCPsych, FRCP(C), FRSB.<sup>2 \*</sup>

<sup>1</sup> Mental Health Group, IMIM-Hospital del Mar, Barcelona, Catalonia, Spain.

<sup>2</sup> Centre for Affective Disorders, Institute of Psychiatry, Psychology & Neuroscience, King's College London, United Kingdom.

**Running title:** Smartphones and bipolar disorder.

**Keywords:** Digital phenotypes, behavioral digital markers, mHealth, smartphones, psychiatry.

**\*Correspondence to:** Prof. Allan H. Young, Centre for Affective Disorders, Institute of Psychiatry, Psychology and Neuroscience, King's College London, PO72, De Crespigny Park, Denmark Hill, London, SE5 8AF, London, United Kingdom. Tel: 02078485895. e-mail: allan.young@kcl.ac.uk

**Word count:** 828

## Main text

From inception until today the field of psychiatry has relied extensively on subjective information to determine diagnosis, illness activity and assess treatment responses. Unlike many other medical disciplines, the information provided by patients or relatives in clinical interviews or collected through scales, continues to be the main guide for both research and clinical practice. Most of these assessments are brief cross-sectional snapshots of altered behaviours, mood or thoughts, which provide only a partial and under-representative picture of the total illness course upon which the whole psychiatric taxonomy is currently based.

Self-reports of people suffering from mental disorders or their relative's perspective is of paramount importance to understanding of these illnesses, but these are not exempt from the inherent limitations of human cognition under both normal and distressing circumstances (e.g., confirmation bias, lack of insight, misinterpretations, etc). Clinician rated measures are subject to the same influences. Additionally, there is, even within leading research groups, a diversity in the application of diagnostic criteria as well as variability in diagnostic criteria and scales inter-rater reliability. These limitations are likely to be principal reasons contributing to the slow development of more specific new treatments along with the scarcity of tools available to predict responses and personalize the currently existing ones.

To overcome these issues, a huge research effort to find and make available reliable auxiliary objective diagnostic methods (such as peripheral, genetic or neuroimaging biomarkers) which might complement the subjective information has been mounted. However, at least until now, almost none of these methods have progressed to real-world clinical practice. Moreover, contrary to initial optimism, there is growing evidence of numerous biases in the body of scientific evidence about biomarkers published so far about the most disabling mental disorders (Carvalho et al., 2016; Prata et al., 2014).

At the same time as the slow progress of psychiatric research over the last few decades, there has been an exponential growth of the Internet, now reaching almost all the most remote populations of the world, which has opened seemingly endless possibilities to the medical field in general including psychiatry. This has already extended mental health care services and interventions at lower costs over video-conferencing and web-based platforms. More recently, this enormous potential was further enhanced with the widespread and ubiquitous access to the Internet through mobile devices, especially smartphones. These increasingly cheaper and accessible devices have been adopted as essential companions to our daily routine and are no longer limited to just communication but now involve entertainment, social networking, shopping and all kind of common daily activities. Attempts have been made to adapt and deliver psychological treatments through user-friendly apps for a variety of mental health disorders. However, the exact role of these apps, either as standalone, companion or adjunctive interventions to face-to-face treatments, is still a matter of discussion.

Information from embedded sensors may be passively and continuously captured by smartphones and uploaded to data servers. These vast amounts of real-time information can reveal many novel and objective aspects of our behaviour which can be used for diverse aims and enables the design of predictive models. Until now most of this information has been used by companies for commercial, marketing and content personalization purposes on a massive scale. However, if the same principles were to be applied as "digital behavioural biomarkers", also known as "digital phenotypes", this might complement clinical subjective measures and thus potentially improve mental health diagnosis and treatments (Hidalgo-Mazzei et al., 2018; Insel, 2018).

This brave new world has been foretold by several researchers during the last few years. Notably however, the attempts to evaluate these approaches have been delayed due to limitations inherent to academic research, principally more limited funding and technical resources in comparison to the private corporate sector. Nonetheless, progress is being made. In this new study (Faurholt-Jepsen et al., 2018), along with previous publications in the field by the same authors, Faurholt-Jepsen et al. have confirmed the enormous potential of smartphones for mental health research and clinical practice. The extraordinary results of this study challenge previous assumptions about specific smartphone usage patterns of bipolar disorder patients across different mood states in comparison to healthy controls. It is important to note that the smartphone-based diagnostic marker evaluated by the authors, which didn't reach adequate levels of specificity (0.39), did show an overall sensitivity (0.92) comparable to the most widely used diagnostic screening tools for bipolar disorder such as the hypomania checklist (HCL-32), the mood disorder questionnaire (MDQ) and the bipolar spectrum diagnostic scale (BSDS). These results suggest that automatically generated objective data can reveal unknown aspects about mental illnesses and enable widely accessible screening tools which complement diagnostic processes.

This paper reports another promising step on the long march towards routine use of smartphones as complements to other sources of data in mental health research and clinical practice. Smartphones might allow us to better capture the whole clinical picture and trajectory of these complex disorders and facilitate the development of much needed better, accessible and tailored treatments.

## Conflict of interests

None

## References

- Carvalho AF, Köhler CA, Fernandes BS, et al. (2016) Bias in emerging biomarkers for bipolar disorder. *Psychological Medicine* 46(11): 2287–2297. DOI: 10.1017/S0033291716000957.
- Faurholt-Jepsen M, Busk J, Þórarinsdóttir H, et al. (2018) Objective smartphone data as a potential diagnostic marker of bipolar disorder. *Australian & New Zealand Journal of Psychiatry*. SAGE PublicationsSage UK: London, England: 000486741880890. DOI: 10.1177/0004867418808900.
- Hidalgo-Mazzei D, Young AH, Vieta E, et al. (2018) Behavioural biomarkers and mobile mental health: a new paradigm. *International Journal of Bipolar Disorders* 6(1). SpringerOpen: 9. DOI: 10.1186/s40345-018-0119-7.
- Insel TR (2018) Digital phenotyping: a global tool for psychiatry. *World Psychiatry* 17(3). Wiley-Blackwell: 276–277. DOI: 10.1002/wps.20550.
- Prata D, Mechelli A and Kapur S (2014) Clinically meaningful biomarkers for psychosis: a systematic and quantitative review. *Neuroscience and biobehavioral reviews* 45: 134–41. DOI: 10.1016/j.neubiorev.2014.05.010.